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10/711,298

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Michael M. Iwatake

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EXAMINER

MAI, ANH D

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 04/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|--------------------------------|--|
| Office Action Summary | Application No. 10/711,298 | Applicant(s) IWATAKE ET AL. | |
| | Examiner Anh D. Mai | Art Unit 2814 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 April 2006.
 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
 5) ☐ Claim(s) _____ is/are allowed.
 6) ☒ Claim(s) 1-10 is/are rejected.
 7) ☐ Claim(s) _____ is/are objected to.
 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Status of the Claims

1. Amendment filed April 6, 2006 has been entered. Claims 1-10 have been amended. Claims 1-10 are pending.

Specification

2. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: A VIA CONTACT STRUCTURE HAVING SILICIDE LAYER.

Note that, the claims are directed to a structure only.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4 and 5 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 4 recites: wherein said first metal and said second metal are the same.

However, according to the Applicant's remarks, they are not the same because first metal is the silicide while the portion of the second metal that formed along the sidewall is a metal, not a silicide. Therefore, they are not the same.

Art Unit: 2814

Claim 5 recites: wherein said first metal consists essentially of cobalt and said second metal consists essentially of titanium.

However, as indicated in the specification and according to the remarks, the first metal is a silicide (103), thus, not consists essentially cobalt. Similarly, the second metal comprises two portions, the bottom portion is a silicide, while the sidewall portion comprises non-silicide metal, thus not consists essentially of titanium.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-5 and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Chung et al. (U.S. Patent No. 5,094,981).

With respect to claim 1, Chung teaches a via contact structure having a via contact to a diffusion region (18) at a top surface of a substrate (10) as claimed, the via contact structure includes:

a first layer (42c) consisting essentially of a silicide of a first metal in contact with the diffusion region (18) at the top surface;

a dielectric region (32) overlying the first layer (42c), the dielectric region (32) having an outer surface and an opening extending from the outer surface of the dielectric region (32);

a second layer (34) lining the opening and contacting the top surface in the opening, the second layer (34) including a second metal lining a sidewall of the opening and a silicide of the second metal self-aligned to the top surface in the opening;

a diffusion barrier layer (36) overlying the second layer (34) within the opening; and

a third layer (40c) including a third metal overlying the diffusion barrier layer (36) and filling the opening. (See Fig. 2d).

Product by process limitation:

The expression “an opening extending from said outer surface through said first layer to said top surface of said substrate” is/are taken to be a product by process limitation and is given no patentable weight. A product by process claim directed to the product per se, no matter how actually made, *In re Hirao*, 190 USPQ 15 at 17 (footnote 3). See *In re Fessman*, 180 USPQ 324, 326 (CCPA 1974); *In re Marosi et al.*, 218 USPQ 289, 292 (Fed. Cir. 1983); *In re Brown*, 459 F.2d 531, 535, 173 USPQ 685, 688 (CCPA 1972); *In re Pilkington*, 411 F.2d 1345, 1348, 162 USPQ 145, 147 (CCPA 1969); *Buono v. Yankee Maid Dress Corp.*, 77 F.2d 274, 279, 26 USPQ 57, 61 (2d. Cir. 1935); and particularly *In re Thorpe*, 227 USPQ 964, 966 (Fed. Cir. 1985), all of which make it clear that it is the patentability of the final structure of the product “gleaned” from the process steps, which must be determined in a “product by process” claim, and not the patentability of the process. See also MPEP 2113. Moreover, an old and obvious product produced by a new method is not a patentable product, whether claimed in “product by process” claims or not.

Note that Applicant has burden of proof in such cases as the above case law makes clear.

Insofar as the structure is concerned, a silicide layer is present at the bottom of the via and contacting the substrate. The newly added limitation is clearly directed to a process, thus, no patentable weight is given.

With respect to claim 2, the first metal of Chung is selected from the group consisting of cobalt (Co), molybdenum (Mo), tantalum (Ta), titanium (Ti) and tungsten (W).

With respect to claim 3, the second metal of Chung is selected from the group consisting of titanium (Ti).

With respect to claim 4, the first metal and the second metal of Chung are the same.

With respect to claim 5, the first metal of Chung consists essentially of cobalt and second metal (55) of Ohsaki are the same metal consists essentially of titanium.

With respect to claim 8, the third metal (40c) of Chung includes tungsten (W).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Art Unit: 2814

5. Claims 6, 7, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung as applied to claim 1 above, and further in view of Ohsaki (JP. Patent No. 08-107087) of record.

With respect to claims 6 and 7, Chung teaches a via contact structure having a via contact including a diffusion barrier layer (36).

Thus, Chung is shown to teach all the features of the claim with the exception of explicitly utilizing metal nitride for the barrier layer.

However, Ohsaki teaches a similar contact structure including: utilizing titanium (metal) nitride for the diffusion barrier layer (56) to function as a barrier layer.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to form the via contact structure of Chung utilizing titanium nitride for the barrier layer as taught by Ohsaki because titanium nitride or titanium-tungsten material are well known in the art to be used as barrier layer.

Furthermore, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416., 125 USPQ 416.

With respect to claim 9, in view of Ohsaki, the opening (54) has a width (0.6 μm or less) which includes the claimed range (of about 250 nm or less) and a height-to-width aspect ratio greater than one.

With respect to claim 10, the aspect ratio value of Ohsaki is about 2.5 which encompasses the claimed range.

Response to Arguments

6. Applicant's arguments filed April 6, 2006 have been fully considered but they are not persuasive.

Regarding the Specification:

It appears that the claimed invention is about a structure, thus, the change of title is required.

7. Applicant's arguments with respect to amended claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event,

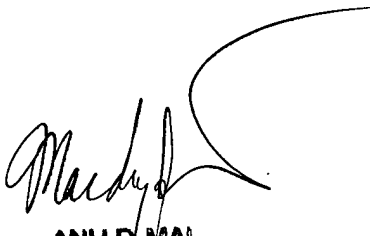
Art Unit: 2814

however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anh D. Mai whose telephone number is (571) 272-1710. The examiner can normally be reached on 8:00AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



ANH D. MAI
PRIMARY EXAMINER